



EXPERIENCE OF AIR TRANSPORT OF NUCLEAR FUEL MATERIAL IN JAPAN

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ABSTRACT

Certified Reference Materials (hereafter called as to CRMs), which are indispensable for Quality Assurance and Material Accountability in nuclear fuel plants, are being provided by overseas suppliers to Japanese nuclear entities as Type A package (non-fissile) through air transport.

However, after the criticality accident at JCO in Japan, special law defining nuclear disaster countermeasures (hereafter called as to the LAW) has been newly enforced in June 2000. Thereafter, nuclear fuel materials must meet not only to the existing transport regulations but also to the LAW for its transport

INTRODUCTION

For an air transport of nuclear fuel material such as CRMs in Japan, nuclear entity should carry out a transport according to the LAW besides the existing domestic transport regulations. As a part of the requirement by the LAW, each nuclear entity is required to prepare its own Nuclear Anti-Disaster Activity Plan. In this presentation, the outline of the Air Transport Accident Manual which was incorporating an adequate system for nuclear disaster countermeasures defined in Nuclear Anti-Disaster Activity Plan, and the procedures of the first air transport of CRMs which was safely carried in 2003 after the enforcement of the LAW are provided.

Package for Certified Reference Materials

CRMs described in this paper are nuclear fuel material like uranium and/or plutonium etc with certified fineness or isotopic composition. Usually, CRMs are enclosed in vial with twofold plastics and held in packaging for transport. Total activity of nuclear fuel material per CRM is almost less than A2 value. For transport, by making total activity of nuclear fuel material of CRMs per packaging be less than A2 value, CRMs have been transported as Type A package (non-fissile). Also, in case of transport of several packages, it is necessary to limit an amount of nuclear fuel material less than the amount corresponding to specified nuclear fuel material. By way of example, packaging has been used for CRMs transport as Type A package (non-fissile) is shown in Figure 1.

This packaging satisfies the technical requirement for Type A package (non-fissile) in IAEA Transport Regulations, 1996 Edition (TS-R-1), and can be used for land, sea and air transport modes because of applying to the technical requirement of ADR, RID, ICAO, IMDG.

Conventional transport of Certified Reference Materials

The main supply sources of CRMs to Japanese nuclear entities are EU and the US.

The transport of CRMs to Japan has been made as Type A package (non-fissile) by air transport without any approval on package design and shipment by Japanese competent authority.

Transport administrator (i.e. transport contractor) has prepared a transport plan covering the information listed below and could carry out a transport of CRMs after getting confirmation on a transport plan by nuclear entity.

- Consignor and Consignee
- Transport administrator and Carrier
- Date and Route of shipment
- Package
- Conveyance (mainly, vehicle and its tie-down system)
- Operation scheme of transport
- Radiation protection
- Liaison scheme
- Emergency response

Special Domestic Law on Nuclear Disaster Countermeasures

After the outbreak of serious criticality accident in September 1999 at JCO located in Tokai-mura, Japan, the LAW was enacted and enforced in June 2000. Since the authorities decided that nuclear disaster countermeasures must be strengthened by the LAW requiring the following procedures and countermeasures.

Securing a swift first-action

In disaster countermeasures, how to take an appropriate first-action based on a swift and accurate collection of information is a key point. Therefore, the LAW newly requires to appoint a Nuclear Anti-Disaster Administrator in each nuclear site who is liable to notify information of specific event to the related authorities. In case specific event turns to emergency case, the Prime Minister will be reported the case immediately. Then, the Prime Minister will declare a state of nuclear emergency, and organize a nuclear disaster countermeasures headquarter in the central government.

Securing an organic collaboration between the central government and local governments

After notification of first sign of special event to the authorities, the central government will dispatch an adequate technical staff to local governments upon requests by local governments. In case of a nuclear emergency, nuclear disaster countermeasure joint conference will be organized among the central government, local governments and relating entities, in order to share information and to cooperate for first-aid countermeasure against a nuclear emergency.

Strengthen emergency response scheme in government

In order for government to effectively respond to emergency, government plans and executes to strengthen their response scheme.

Define nuclear entity's liability

Nuclear entity is liable and obliged to prepare a Nuclear Anti-Disaster Activity Plan in order to unerringly conduct their business for prevention from an outbreak and a spread of nuclear disaster.

As described in above, the LAW is applied for transport of nuclear fuel material and nuclear entity is liable to notify the authorities in case of outbreak of a specific event in transport. The following is the required criteria for a state of notification and nuclear emergency in transport outside site that nuclear entity is liable to notify the authorities (Refer to Table 1).

Table 1 Criteria for a state of notification and nuclear emergency in transport outside site

		A state of notification	A state of nuclear emergency
Specific event		There is a probability or an occurrence of effluence of radioactive materials from package beyond routine conditions and normal conditions of transport.	There is a probability or an occurrence of effluence of radioactive materials from package beyond accident conditions of transport.
Criteria	Radiation level	100 μ Sv/h or over (at 1m from surface of package)	10mSv/h or over (at 1m from surface of package)
	Effluence of radioactive material	In a fire, an explosion or an equivalent event, there is a probability or occurrence of effluence of radioactive materials.	In a fire, an explosion or an equivalent event, there is a probability or an occurrence of effluence corresponding to A2 value of radioactive materials.
Liaison		Nuclear entity notifies to the competent minister(government), the provision governor and mayors(local governments).	Nuclear entity notifies to the competent minister(government), the provision governor and mayors(local governments). Then, Prime minister is reported from the competent minister.
Notes		Excepted package and Type IP-1 package are excluded from the subject of notification, since the contents of these package is nuclear fuel material with extremely low risk.	Excepted package and Type IP package are excluded from the subject of nuclear emergency. That is, it is impossible to suffer an effect corresponding to A2 value from the viewpoints of exposure, since the concentration of radioactive material is very low for the contents of these packages, though it is possible to be packed more than A2 value into package.

For the transport of CRMs as Type A package (non-fissile), the events corresponding to a state of notification (and a state of nuclear emergency : in case total activity of nuclear fuel material per conveyance with packages is A2 value or over) may occur. Therefore, in advance, the transport concerned should study possible events and prepare the way to cope with the events.

Presentation of Air Transport of Certified Reference Materials

After the enforcement of the LAW, all the nuclear entities were requested to prepare Nuclear Anti-Disaster Activity Plan in order to secure a swift first-action against nuclear disaster countermeasure. Therefore, for the transport of nuclear fuel material, besides confirming conformity to the technical requirement provided in transport regulation, nuclear entity newly prepares a Nuclear Transport Accident Manual in usage of Nuclear Anti-Disaster Activity Plan that was prepared to secure a swift first-action in nuclear disaster countermeasure.

. The first air transport of CRMs from Europe to Japan was safely carried out after the enforcement of the LAW as Type A package (non-fissile) in 2003. In this paper, the arrangement and procedures of air transport how to meet to the LAW is presented.

Preparation of Air Transport Accident Manual

For arranging air transport of CRMs as Type A package (non-fissile), with close consultation with competent authorities, nuclear entity prepared Air Transport Accident Manual based on Nuclear Anti-Disaster Activity Plan etc that had been already prepared under nuclear entity's responsibility. For nuclear fuel material, this Air Transport Accident Manual is the first one for the mode of air transport in Japan. The following is the information described in Air Transport Accident Manual.

- Definition of event

Abnormal event is defined as "an event that transport schedule must be changed by, when some events occurs to influence navigation of aircraft or integrity of package", and roughly classified into the following two states.

Differential state	a state that transport schedule must be changed by cancellation of a flight, delay of take-off or landing of aircraft and so on.
Accident state	a state that aircraft or package is damaged, a state that terror, sabotage, lost or thief of package occurs

The events that must be notified as abnormal event are shown in Figure 2.

- Response organization in abnormal event

For the case abnormal event occurs, response organization by the transport concerned is provided as shown in Figure 3.

Transport Administration Headquarters	Organization in normal and differential states that is set up whenever transport is carried out, and performs transport administration, communicates with the parties concerned, collects information etc. in order to transport safely.
Transport Accident Countermeasure Headquarters	Organization in accident state that is set up to performs accident response.
Nuclear Anti-Disaster Organization	In case an event transfer to the events that nuclear entity is liable, that is, a state of notification by Nuclear Anti-Disaster Administrator or a state of nuclear emergency in the LAW, Nuclear Anti-Disaster Organization is set up.

In normal state or differential state, transport administrator and airlines collect transport information, and let this information be available for a swift first-action in abnormal event.

In accident state, accident response is performed by Transport Accident Countermeasure Headquarter of nuclear entity, or by Nuclear Anti-Disaster Organization. Also, the group that is dispatched to accident site is organized.

- Liaison

Liaison is provided for normal state and abnormal state.

Normal state	In order to accurately grasp transport operations, nuclear entity gets information from transport administrator and airlines according to Transport Plan.
Abnormal state	In case nuclear entity is notified by transport administrator and/or airlines that an abnormal event occurs, according to liaison scheme, nuclear entity communicates with the parties concerned etc. The liaison scheme and the form of communication are provided in Air Transport Accident Manual. While, the carrier concerned directly notifies their competent authority too when abnormal event occurs.

Also, response in normal and abnormal state and education/training etc are provided in Air Transport Accident Manual.

Preparation of Transport Plan

Transport administrator was instructed by nuclear entity about what Air Transport Accident Manual provides, then prepares Transport Plan. On this occasion, transport administrator revised the liaison scheme described in Transport Plan taking in the liaison scheme provided in Air Transport Accident Manual. The liaison scheme in Transport Plan is shown in Figure 4.

Implementation of communication training

Based on Air Transport Accident Manual and Transport Plan, the parties concerned to the air transport confirmed the contents of communication response during air transport. Then, for the case abnormal event occurs, communication training among the parties concerned to the air transport was implemented in order to confirm that the first notification can be swiftly managed, then the notification can be surely passed to following communication.

Implementation of Transport of CRMs

After the implementation of communication training, again, let the parties concerned to the air transport well know the contents of Air Transport Accident Manual and Transport Plan, then transport of CRMs was carried out safely without a event that transport schedule must be changed by. Between departure and arrival of aircraft with the package, moreover, until the package was brought in the warehouse in arrival airport, transport administrator has periodically collected the information of transport operations, and passed nuclear entity the information one by one.

CONCLUSION

In the past, by confirming conformity to the technical requirement for package provided in transport regulation and information of transport operations during air transport, that is, departure and arrival of aircraft with package, nuclear entity had made air transport of CRMs implement as Type A package (non-fissile).

But, after the enforcement of the LAW, nuclear entity is requested to secure a swift first-action with grasping accurate information during transport. Though it is not required for air transport as Type A package (non-fissile) to get competent authority approval from the viewpoint of transport regulation, if nuclear entity does not secure a swift first-action that is obliged to nuclear entity in transport, the transport almost can't be carried out.

In this paper, it is reported that air transport of CRMs as Type A package (non-fissile) was carried out safely in the same way as conventional transport by preparing Air Transport Accident Manual in usage of Nuclear Anti-Disaster Activity Plan, describing the liaison scheme in Transport Plan, letting the parties concerned to the air transport well know the contents of Air Transport Accident Manual and Transport Plan.

We are deeply grateful to the parties concerned to the air transport for making up response organization in abnormal event in cooperation with competent authority, the airport authorities, airlines, nuclear entity, transport administrator, carrier.

REFERENCE

TAISEI SHUPPAN (2000): The statute book on nuclear business, Addendum No. 256· 257 Interpretation of Special law on nuclear disaster countermeasures

R. BECKERS : Certificate of approval of the TNB 169 Transport of radioactive materials - Type "A" -. TNB Reference No. 10.126/94D

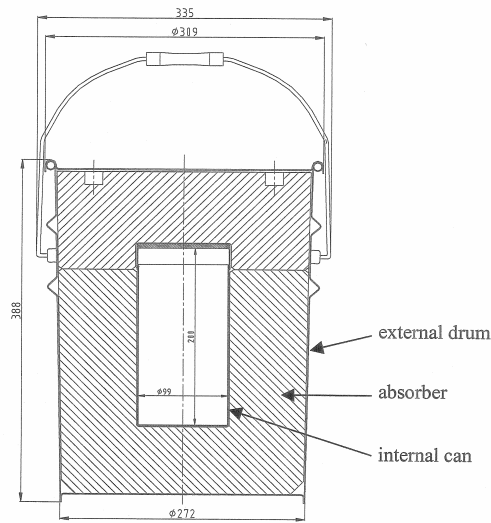


Figure 1 Packaging used for CRMs transport as Type A package : TNB169 packaging

Normal state
In case of no change from Transport Schedule



Abnormal state

Differential state

- | | |
|-----------------------------|--|
| ● No Loading | Decision by captain, Imperfection of documents, Miss of loading |
| ● Cancellation of flight | Failure of Aircraft, Bad weather |
| ● Delay of take-off | Maintenance for failure of aircraft, Bad weather |
| ● Change of arrival airport | Functional depression of airport, Bad weather, Failure of Aircraft |

Accident state

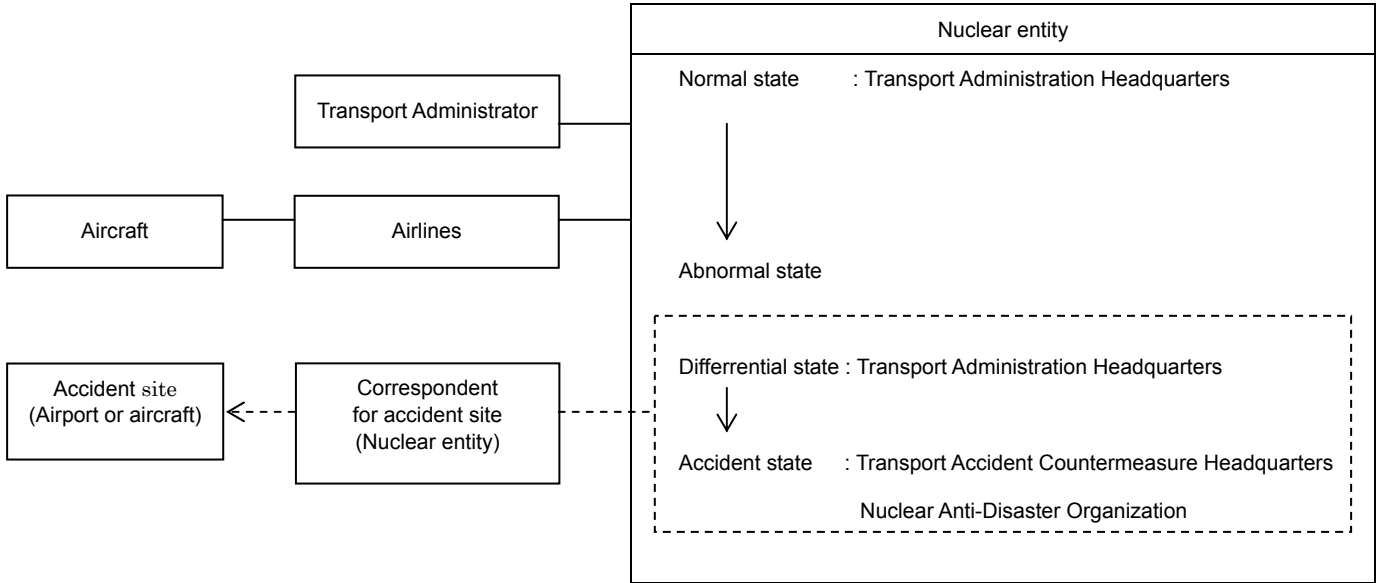
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|----------------------------|--|
| ● Emergency condition | In case of emergency landing (A fire or decompression etc in flight) |
| ● Aircraft accident | Crash, collision, fire, contact of aircraft |
| ● Loading accident | Collapse, fall of freight, Fire of warehouse etc |
| ● Terror, Sabotage | |
| ● Lost or thief of package | |

The following is the criteria for a state of notification by Nuclear Anti-Disaster Administrator and a state of nuclear emergency in transport.

- | | |
|--|--|
| ● A state of notification by Nuclear Anti-Disaster Administrator * | There is a probability or an occurrence of effluence of radioactive materials from package beyond routine conditions and normal conditions of transport. |
| ● A state of nuclear emergency* | There is a probability or an occurrence of effluence of radioactive materials from package beyond accident conditions of transport. |

* Refer to Table 1

Figure 2 The events that must be notified as abnormal event



Broken line : In case abnormal event occurs, these response organizations is set up by nuclear entity

Figure 3 Response organization by the transport concerned

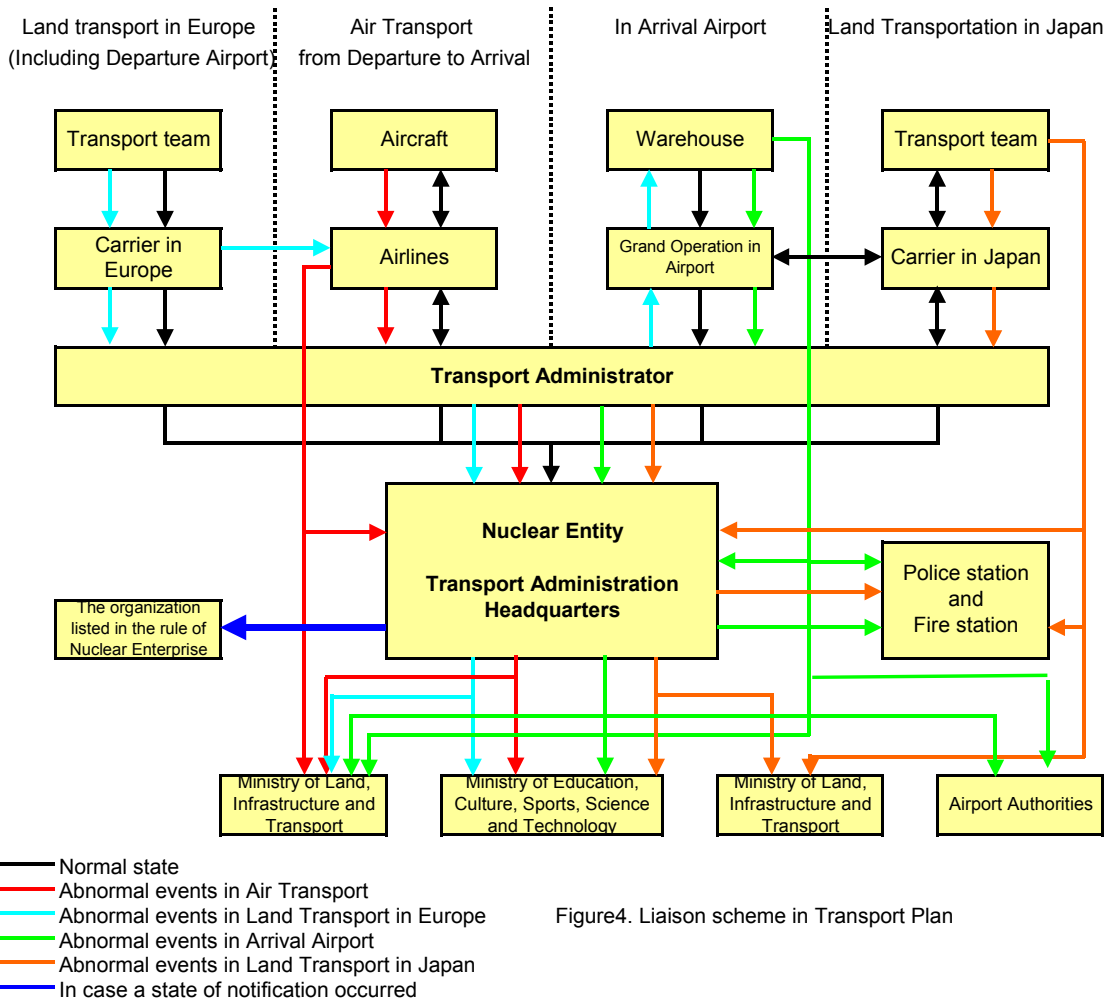


Figure4. Liaison scheme in Transport Plan